

Laboratory Test Utilization; Improving Outcomes and Reducing Costs

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February 28, 2017



CardinalHealth

Essential to care™

*Logistics
Product
Business
Patient*

Learning Objectives



Identify how the laboratory can partner with stakeholders across the healthcare system to reduce healthcare costs by properly utilizing laboratory tests

Define how laboratory test utilization and decision support tools can enable clinicians to improve patient outcomes

Demonstrate how the laboratory can be utilized to address the transition from fee-for-service to fee-for-value

Overutilization

- Ordering test panels* (tests as groups)
- Repetitive test orders* (daily orders)
- Incomplete understanding*
 - impact of low pre-test probability*
 - of the consequences of overutilization*
- Patient pressure* (“educated patients”, internet, advertisement)
- Defensive testing*
- Perverse financial incentives* (more tests = more revenue)
- Physicians have been thought to
 - **“leave no stone unturned”**
 - Patient harm
- Order patterns are influence by the presentation of the lab test orders
 - Providers are moving at fast-pace
- Training/practice (“I was taught that”, “I have always done that way”)

* Astion ML. 2006. Interventions that improve laboratory utilization: from gentle guidance to strong restrictions. *Laboratory Errors and Patient Safety*. 2(4):8-9

We are educated to think:

- Source of Error (Quality Assurance)
 - Pre-Analytical
 - Analytical
 - Post-Analytical

Common issues not covered:

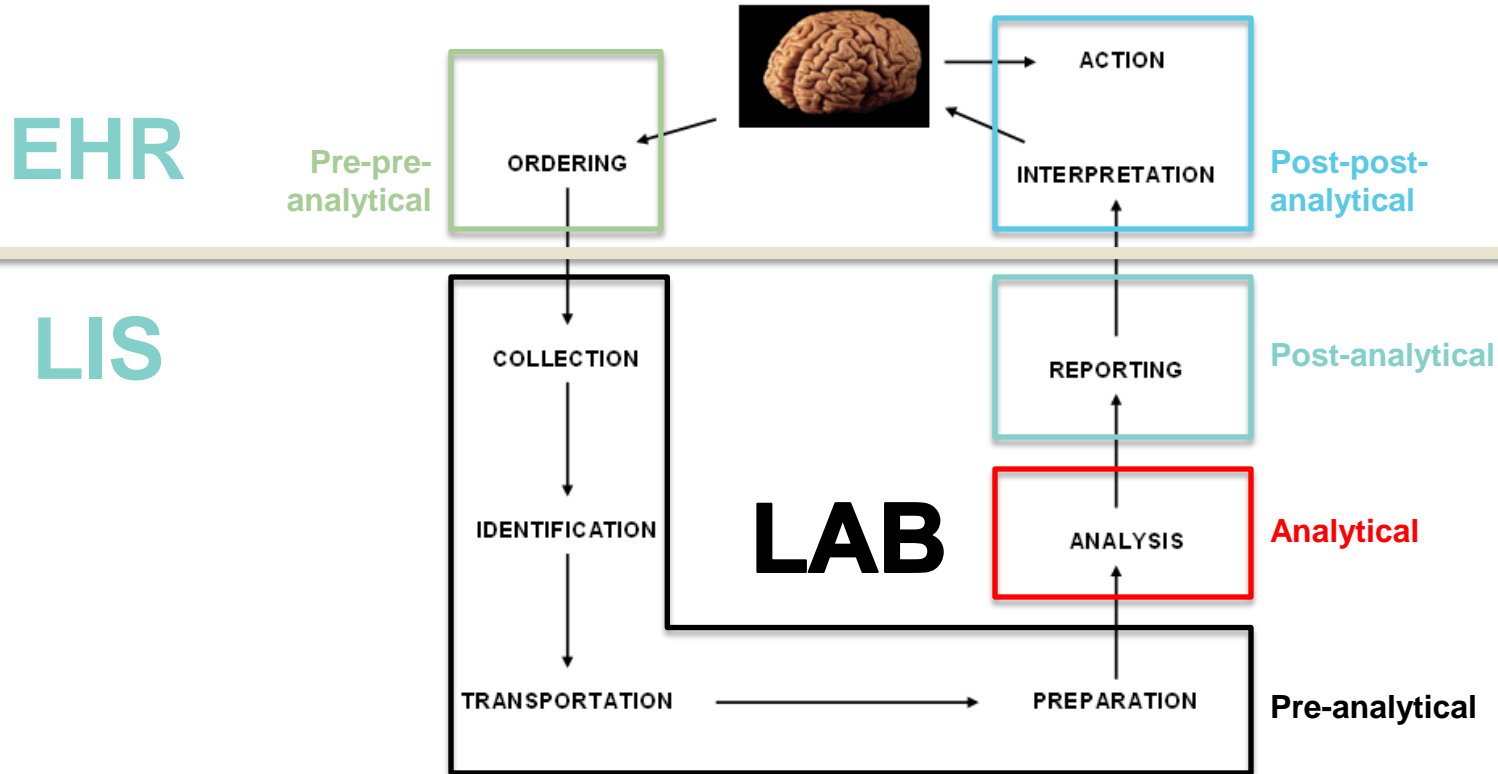
Over Utilization ^{1,2}
Under Utilization ^{1,2}
Wrong Order
Off Label Use

1) Jones, Kathy. *General Health News*. Nov. 2013. www.medindia.net/news/three-in-10-laboratory-blood-tests-unnecessary-127916-1.htm

2) Ming Zhi, Eric L. et. al. *PLOS|One*. November 2013. www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0078962

We should be thinking:

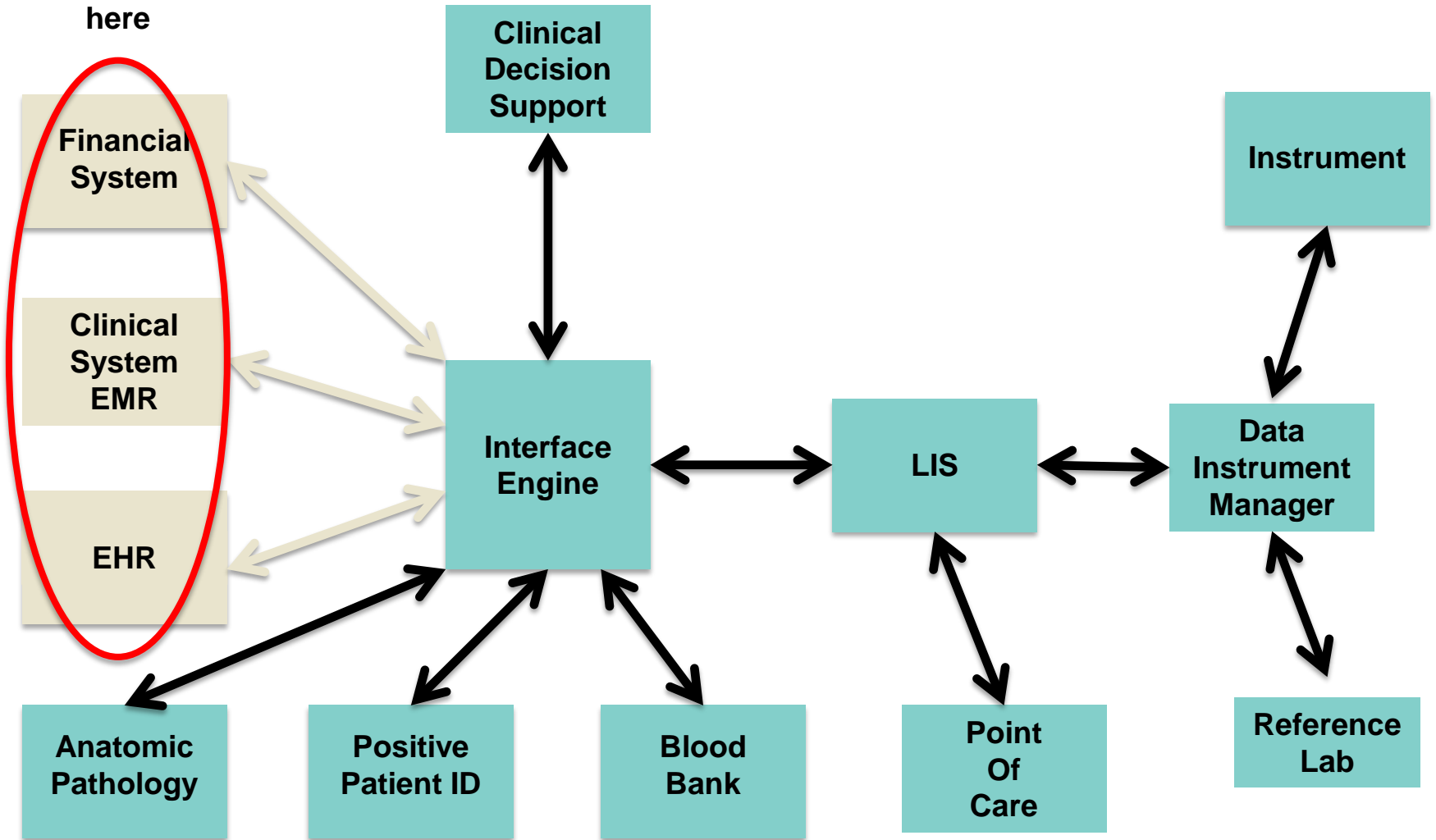
Physician



George Lundberg (JAMA 1981:245:1762-1763) The brain-to-brain turnaround time loop

Example – IT Tools Available to Improve Lab Test Utilization

The Patient lives here



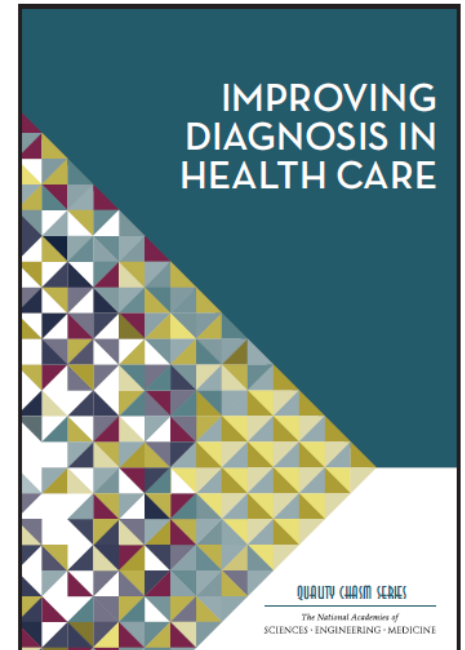
Diagnostics Errors

Institute of Medicine

Improving Diagnosis in Health Care

Quality Chasm Series

Getting the right diagnosis is a key aspect of health care: It provides an explanation of a patient's health problem and informs subsequent health care decisions. For decades, diagnostic errors—inaccurate or delayed diagnoses—have represented a blind spot in the delivery of quality health care. Diagnostic errors persist throughout all settings of care and continue to harm an unacceptable number of patients.



Committee on Diagnostic Error in Health Care, National Academies of Science, Engineering, and Medicine. Washington, DC: National Academies Press; 2015. Paperback ISBN: 978-0-309-37769-0

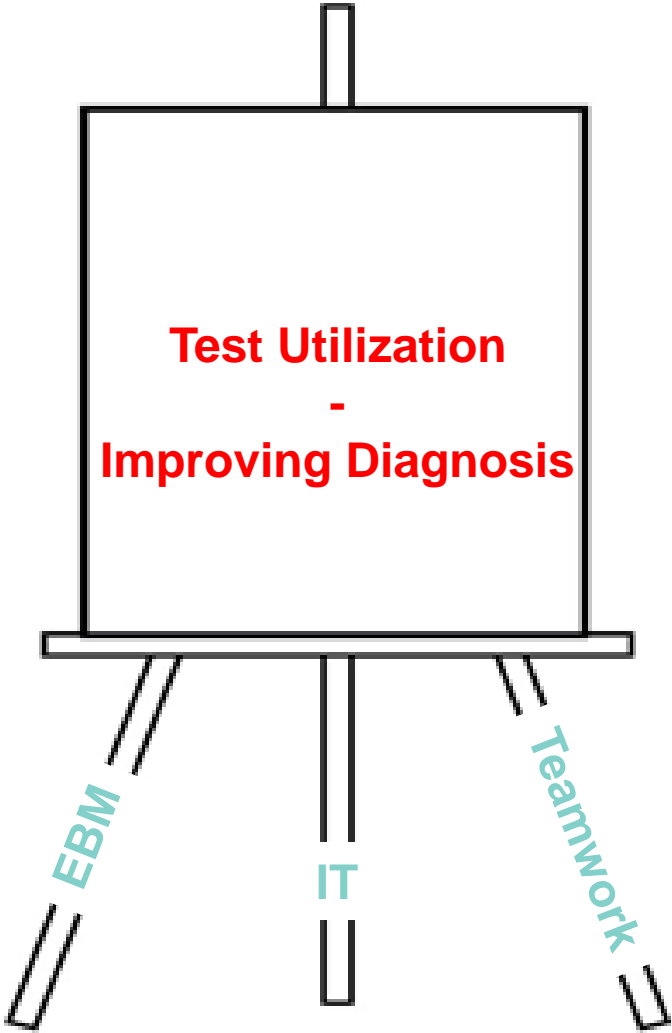
Free PDF: <https://www.nap.edu/catalog/21794/improving-diagnosis-in-health-care>

Goals for Improving Diagnosis and Reducing Diagnostic Error



1. Facilitate more effective teamwork in the diagnostic process among health care professionals, patients, and their families
2. Enhance health care professional education and training in the diagnostic process
3. Ensure that health information technologies support patients and health care professionals in the diagnostic process
4. Develop and deploy approaches to identify, learn from, and reduce diagnostic errors and near misses in clinical practice
5. Establish a work system and culture that supports the diagnostic process and improvements in diagnostic performance
6. Develop a reporting environment and medical liability system that facilitates improved diagnosis by learning from diagnostic errors and near misses
7. Design a payment and care delivery environment that supports the diagnostic process
8. Provide dedicated funding for research on the diagnostic process and diagnostic errors

Committee on Diagnostic Error in Health Care, National Academies of Science, Engineering, and Medicine. Washington, DC: National Academies Press; 2015. Paperback ISBN: 978-0-309-37769-0



Test Utilization Approaches



- Computerized Physician Order Entry (CPOE)
 - Order-set
 - Lab formulary
 - Duplicate Checking (Test Frequency)
 - Decision Support
 - Access to EBM/Guidelines at the point of entry
 - Alerts
 - Pop-up
 - Dx Algorithms
- Education
 - Physicians
 - Mid level Providers
 - Nursing
 - Patients (Patient Access Portal)

Test Utilization Approaches



- Interdisciplinary team work
- Analysis of Current Utilization Pattern
 - Standing orders
 - Redundancy (profiles, reflex testing)
 - Frequency
- Laboratory Champion/s (Clinician/s)
- Utilization Committee
 - Physician Peer Review/Score Card/Peer Comparison
 - Best Practice Ordering Guidelines
 - CMS Core Measures



What can I do?

Laboratory

Blood Studies

- CBC w/Diff Now & Routine Daily
- Creatinine (basic Metabolic) Now & Routine Daily
- During therapy monitor blood glucose, BUN, creatinine, osmolality, serum electrolytes, and venous pH every 2 to 4 hours until stable
- Glucose Now
- BUN & Creatinine Now
- Osmolality Now
- Electrolyte Now
- Comprehensive Metabolic Panel Now
- Acetone Now
- Hemoglobin A1C Now
- Lipid Panel Routine
- Culture, Blood (BC) Now. Times 2 from different sites per hospital's protocol.

Urine Studies

- Urinalysis Routine
- Culture, Urine (URCUL) Routine

Reminder

DKA Order Set
Lab Orders

Link (EBM)

CPOE:
Entry of physician orders and/or instruction for treatment into a computer rather than on paper

Order-set:
A group of orders organized along a common theme Signs or symptoms, *Diagnosis*, Procedure, etc


It is a Clinical Decision Support tool!

No longer Available

One of the advantages of electronic order-sets:
Old version is replaced with new version

You can use CPOE/Order-sets to remove obsolete tests

Best Evidence/CMS Core Measures

 Blood cultures should be obtained before administering antimicrobial therapy

Culture, Blood (BC) Now. Times 2 from different sites per hospital's protocol.



CMS Core Measure

For adults patients: Ordering a single blood culture constitutes a substandard of care and should be avoided.*

CPOE Solution:
Single BC orders not available for adults patients

New Sepsis CMS core measure (Oct-2015)

Data elements for the **Three Hour Bundle**:

1. **Initial lactate level collection,**
2. **Blood culture collection,**
3. Broad spectrum or other antibiotic administration and
4. Crystalloid fluid administration.



For patients exhibiting signs of Sepsis/Septic Shock please order Blood Culture x 2 with Lactic Acid

Blood Culture x 2 - 2 Sites Same Time with Lactic Acid

You can use CPOE/Order-sets to improve patient care/safety

Complete Blood Culture Menu

Inpatient Orders

ED Orders

Blood Culture Orders	
Policy & Procedure	
Blood Culture x 2 - 2 Sites Same Time with Lactic Acid	
	Culture, Blood (BC) Stat- Site 2 (2 Sites - Same Time) (required)
	Culture, Blood (BC) Stat- Site 1 (2 Sites - Same Time) (required)
	Lactic Acid Stat (required)
	Every 15 min x 2
	Culture, Blood (BC) Stat Every 15 Minutes for 2 Times
	Every 30 min x 2
	Culture, Blood (BC) Stat Every 30 Minutes for 2 Times
	2 Sites Same Time
	Blood Culture Bilateral - 2 Sites Same Time
	Blood Culture Central Line & Peripheral - Same Time
	Blood Culture Port & Peripheral - Same Time
	1 Site Same Time
	Blood Culture Port
	Once (To be used for Pediatric Patients ONLY)
	Culture, Blood (BC) Stat
ED	
ED Blood Culture x 2 - 2 Sites Same Time with Lactic Acid	
	Culture, Blood (BC) Stat- Site 1 (2 Sites - Same Time) (required)
	Culture, Blood (BC) Stat- Site 2 (2 Sites - Same Time) (required)
	Lactic Acid Stat (required)
	ED Blood Culture - Pediatric

Laboratory Formulary

Clinical Decision Support (simple)



Laboratory

Blood Studies

General Postoperative Care Admit - CPOE

- CBC W/O Diff Next AM for 1 Days
- CHEM8 (Basic Metabolic) ASAP
- CHEM8 (Basic Metabolic) Next AM for 1 Days
- Comprehensive Metabolic Panel Next AM for 1 Days
- Troponin-I measurements for patients with high or intermediate clinical risk who have known or suspected CAD and who are undergoing high- or intermediate-risk surgical procedures NEW
- Troponin-I ASAP NEW
- Troponin-I Next AM for 2 Days NEW

Reminders

- Evidence for the use of a postoperative BNP level is inconclusive NEW

Urine Studies

- Urinalysis Routine

Right Test

Wrong Test

Clinical Decision Support (complex)

INR rule when physician orders Warfarin

1. If no INR results in the past 3 days:

▼ Medication/IV

Warfarin 1 mg PO QDAYC for 1 Doses

▶ No INR results available within last 3 days.

2. If one INR result in the past 3 days:

▼ Medication/IV

Warfarin 1 mg PO QDAYC for 1 Doses

▶ Results: INR= 1.5 (Obs. Date: 01-18-2011 06:18).

3. If two INR results in the past 3 days:

▼ Medication/IV

Warfarin 2 mg PO QDAYC for 1 Doses

▶ Results: INR= 2.8 (Obs. Date: 01-18-2011 05:25); INR= 1.1 (Obs. Date: 01-17-2011 05:15).

When the physician orders the Warfarin the PT order is automatically ordered for the next day

You can use CPOE/Order-sets to order the Right test at the Right time

Clinical Decision Support (clinical information)

2015 Antimicrobial % Susceptible Report OhioHealth Mansfield/Shelby

	# of isolates	AMPICILLIN	AZTREONAM	PIPERACILLIN/TAZOBACTAM	CEFAZOLIN	CEFTAZADIME	CEFTRIAXONE	IMIPENEM	GENTAMICIN	CIPROFLOXACIN	LEVOFLOXACIN	NITROFURANTOIN	TRIMETH/SULFA	CLINDAMYCIN	ERYTHROMYCIN	OXACILLIN	PENICILLIN	RIFAMPIN	TETRACYCLINE	VANCOMYCIN	
Citrobacter freundii	94			91	1	89	89		96	95	95	94	91								
Enterobacter cloacae	188 (56)		(82)	83	0	81	75	94	94	93	93	32	93								
Escherichia coli	3185 (517)	47	(94)	96	86	95	92		92	65	65	93	72								
Klebsiella pneumoniae	758 (164)		(77)	89	83	87	85	99	88	83	83	34	82								
Proteus mirabilis	594 (104)		(97)	100	91	97	97		84	44	49	0	56								
Pseudomonas aeruginosa	659					86		76	85	63	58										
Enterococcus sp.	840	88								36	36	88					87				85
Coag. Neg. Staph	356								86			99	53	53	31	44	10	97	74	100	
Staphylococcus aureus	1534								98			100	97	57	34	49	13	99	84	100	

Linked to Positive BC Result

In development

Linked to Antibiotic Orders

Link CPOE orders and/or Lab Results to Useful Clinical Information

Algorithm

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY MAY 2010, VOL. 31, NO. 5

SHEA-IDS A GUIDELINE

Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults: 2010 Update by the Society for Healthcare Epidemiology of America (SHEA) and the Infectious Diseases Society of America (IDSA)

Stuart H. Cohen, MD; Dale N. Gerding, MD; Stuart Johnson, MD; Ciaran P. Kelly, MD; Vivian G. Loo, MD; L. Clifford McDonald, MD; Jacques Pepin, MD; and Mark H. Wilcox, MD

Diagnosis of *Clostridium difficile* Infections in Adults: Testing Algorithm Medical Staff Approved

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Liz DeHaan, Infection Prevention and Control Coordinator
Bert Mowry, Infection Prevention and Control Assistant

Date: May, 2012

Clostridium difficile Infections (CDI) - The Problem ^(1,2,3,8-9)

- *Clostridium difficile* is a bacterium that can cause symptoms ranging from diarrhea to life-threatening inflammation of the colon.
- *Clostridium difficile* is the most common bacterial diarrheal pathogen in industrialized world (estimated 3 million cases per year in the US)

Search Personal Favorites

Favorites

- * ED Common Orders
- * ED Treatments
- ** ED Nursing Protocol
- ** SCPE Adult Order Sets

Clostridium difficile Orders

Only unformed stools should be tested unless ileus is suspected. Repeat testing should be discouraged and test of cure should not be performed.

[Guidelines - C. difficile](#)
[MedExec protocol - C. difficile](#)

- Clostridium difficile Routine- Diarrhea Stool
- Clostridium difficile Routine- Suspected Ileus

Specimen ID View

Tests Edit View Options Help

270.00013 [M] 37 CDSPEC [3101546690] [470601]

MH [CMT: Diarrhea Stool]

Call Request Log Call Add Comments View Details Enter Individual Results Enter Batch Results

Specimen ID	Sampl ID	Test	Result	QA Flag	Previous Result (D/T)
270.00013	5311	CDSPEC			

1 test(s) loaded Non Micro

- "YES" for unformed stools
- "NO" for formed stools

Specimen ID View

Tests Edit View Options Help

270.00014 [F] 28 TESTING C [3101546689] [370601]

MH [CMT: Suspected Ileus]

Call Request Log Call Add Comments View Details Enter Individual Results Enter Batch Results

Specimen ID	Sampl ID	Test	Result	QA Flag	Previous Result (D/T)
270.00014	5310	CDSPEC			

1 test(s) loaded Non Micro

- Always "YES" (when ileus is suspected, formed stool is an acceptable specimen for testing)

Clostridium *difficile* Algorithm

Clinical Impact (Patients diagnosed with CDI)

Impact on Nursing:
49% decrease in
RN's stool collection

Overutilization:
52.5% decrease in
C. difficile testing

The laboratory cost
for *C. difficile* testing
decreased 23%
(from \$5468.17 to
\$3972.66 per month)

Inpatients with "+" <i>C. Diff.</i> results	LOS (Days)
Pre-Algorithm	12.9
Post-Algorithm	8.4
Reduction	4.5

Analytical
Performance
Nursing/Lab

Test of Cure
Social Workers

Patient Advocacy
(To Home ASAP)

Resulting in an average total hospital cost savings per patient of \$9,849.50; this translates into a total annual savings of approximately \$1.1 million per year.

Education for Providers

Clinical Laboratory Tests for Nurses

Eugenio H. Zabaleta, Ph.D.

CLIA

- Clinical
- Laboratory
- Improvement
- Amendments

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Lab Test Performance

- Analytical Performance
 - Accuracy, reproducibility and precision
 - MLT/MT (Clinical Chemist &/or Pathologist)
- Clinical Performance
 - Sensitivity and specificity
 - Physician (Clinical Chemist &/or Pathologist)

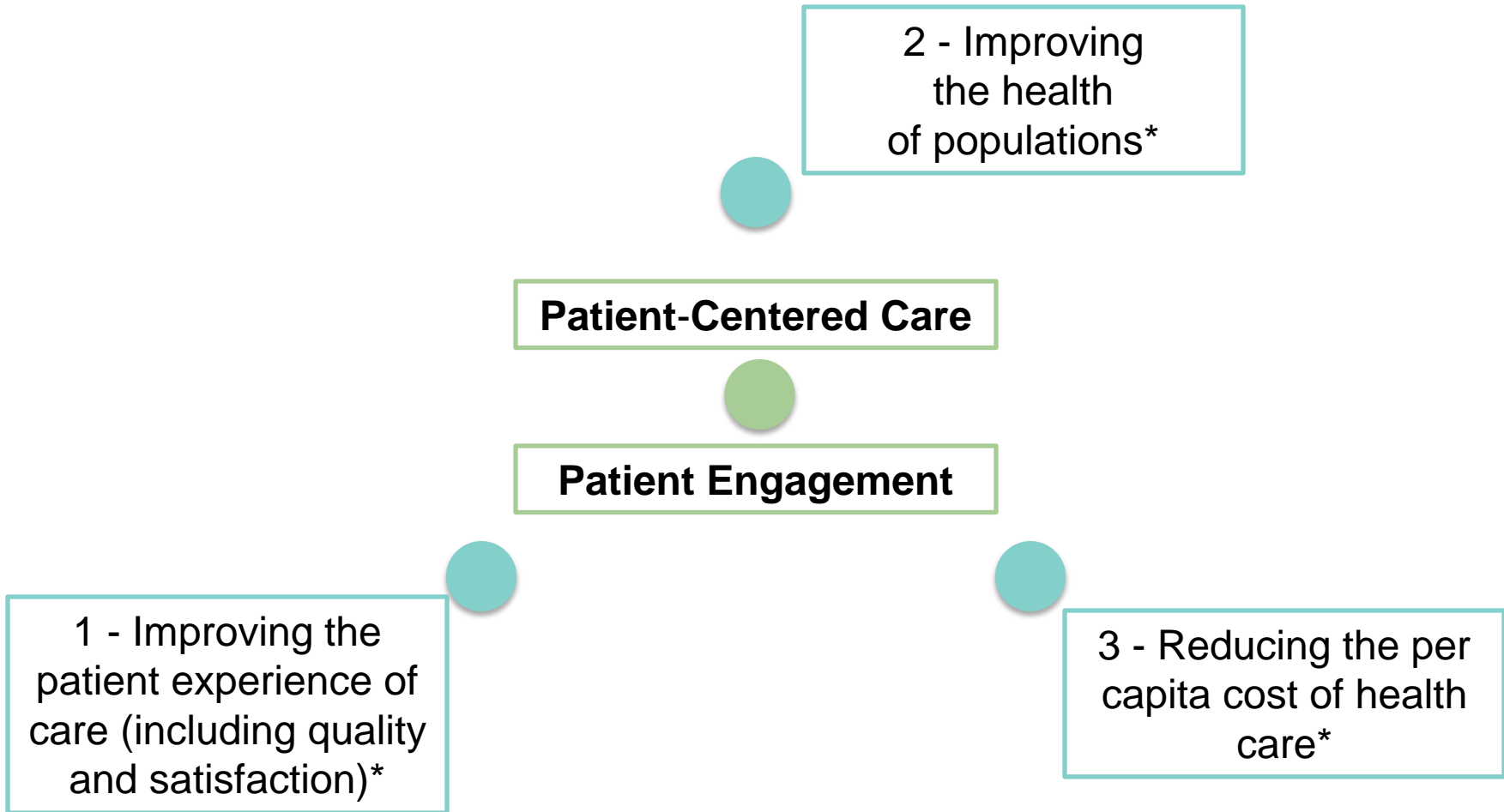
Case #1 *(Disagreement between Analytical and Clinical Performance of a lab test)*

- A fifty year-old-male is diagnosed with Chronic Lymphocytic Leukemia
- Plasma K⁺ was critical high
- The nephrologists and Lab decided to evaluate the patient's K⁺ level with different techniques (communication)
- Final Diagnosis (related to the K⁺ issue): pseudohyperkalemia with Leukocytosis, due to volume depletion

The laboratory needs to develop Strong Lab-Providers Teamwork based on:

- Respect
- Equality
- Understand each others strength, weakness, workflow, regulations

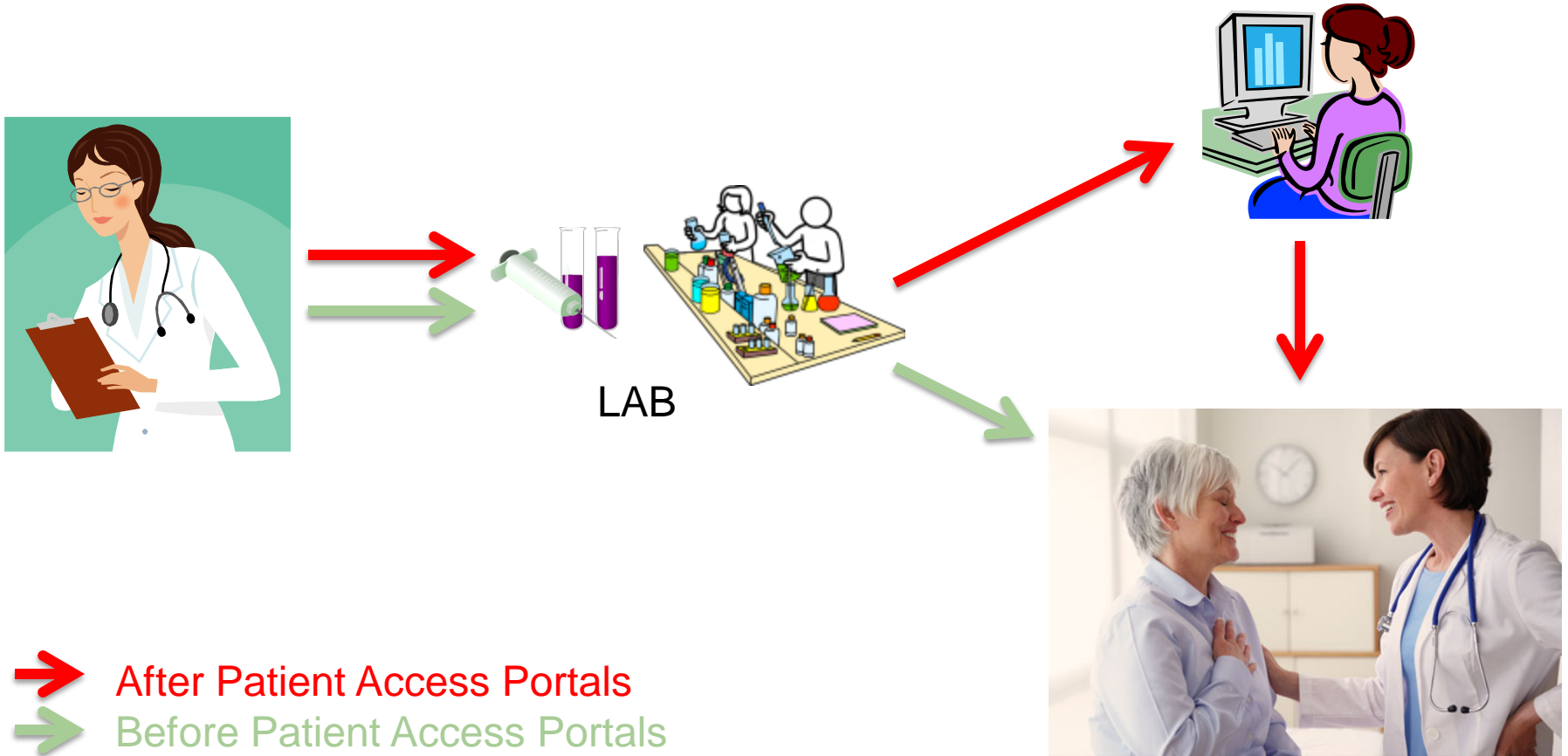
Patient Center Care and the Triple Aim Initiative



* <http://www.ihl.org/engage/initiatives/tripleaim/pages/default.aspx>

Patient Access Portals

It is Changing Clinical Practice



Patient Access Portals

Patient education

https://hiewebdev01.isimason.com/MedCentralTest/Dialogs/FlowSheet.aspx?patID=V1E4MmxTRkqjA90

Flow Sheet View













Category Panel

Category: Cardiovascular Disease Primary Prevention

Date Filter: Date Range Time Period
 Start Date:
 End Date:

Patient Name: Date of Birth:

Export to Excel

Graph	Info	Test	Units	2/23/2015	2/25/2015	2/26/2015	2/27/2015
		Total Cholesterol	mg/dL	178	177	176	176
		Tryglyceride	mg/dL	73	73	73	72
		HDL Cholesterol	mg/dL	54	56	56	53
		LDL (CALC)	mg/dL	109	106	105	109
		Very Lo Density Lip (CALC)	mg/dL	15	15	15	14
		Risk Factor Lip (CALC)		3.3	3.2	3.1(L)	3.3

https://research.nlm.nih.gov/7x%3Aproject=medlineplus/query=cholesterol-MedlinePlus-Search-R-Windows-Internet-Explorer

U.S. National Library of Medicine

MedlinePlus
Trusted Health Information for You

cholesterol GO

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Health Topics Drugs & Supplements Videos & Tools **Espanol**

Home → Search Results Search Help


Refine by Type

All Results (2,109)

- Health Topics (40)
- External Health Links (1,208)
- Drugs and Supplements (234)
- Medical Encyclopedia (226)
- Videos and Tutorials (44)
- News (27)
- MedlinePlus Magazine (83)
- Other Resources (14)
- Multiple Languages (20)

Cholesterol

Cholesterol is a waxy, fat-like substance that occurs naturally in all parts of the body. Your body needs some cholesterol to work properly. But if you have too much in your blood, it can combine with other substances in the blood and stick to the walls of your arteries. This is called plaque. Plaque can narrow your arteries or even block them.



High levels of cholesterol in the blood can increase your risk of heart disease. Your cholesterol levels tend to rise as you get older. There are usually no signs or symptoms that you have high blood cholesterol, but it can be detected with a blood test. You are likely to have high cholesterol if members of your family have it, if you are overweight or if you eat a lot of fatty foods.

(Read more)

Results 1 - 10 of 2,109 for cholesterol

1. **Cholesterol** (National Library of Medicine)
 Cholesterol is a waxy, fat-like substance that occurs naturally in all parts of the body. Your body needs some cholesterol to work properly. But if you have too

“Graph button”

Patient Access Portals

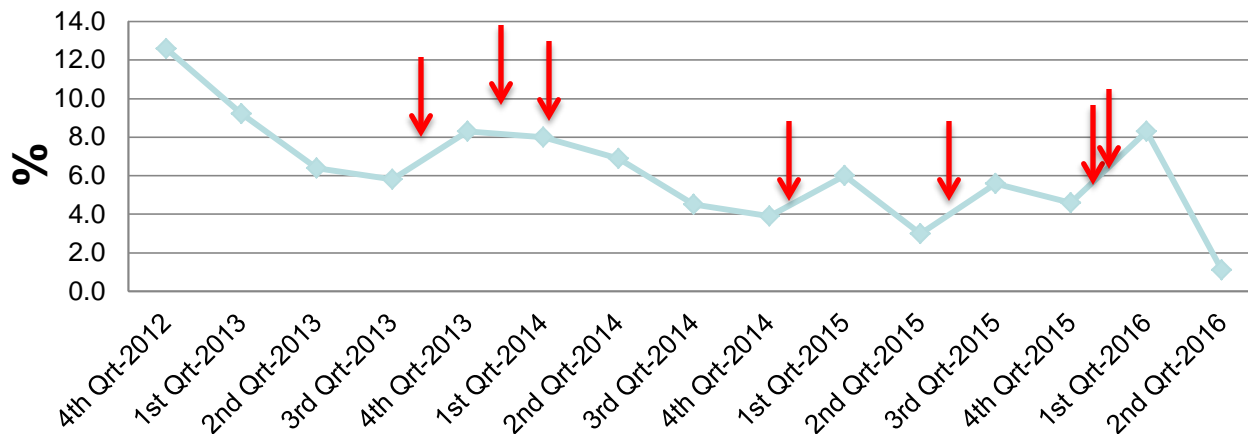
The power of Patient Engagement



- Clostridium *difficile* Algorithm*:
 - Only diarrheal stools
(except when ileus is suspected)
 - No repeat testing
(except when clinically indicated for one time)
 - No test of cure

C diff Previous Interpretation			
View	Details	History	Notes
Previous Result found within last 7 days. No test will be performed as established per MedCentral Clostridium difficile Infection Testing Algorithm. Previous Result: Negative for toxigenic C. difficile. Previous Result Date and time: (02 Jul 13) (13:18)			

Repeat Testing



* Cohen SH, Gerding DN, Johnson S *et al.* Infect Control and Hosp Epidemiol 2010; 35: 431–45.

Test Utilization Approaches



- Interdisciplinary team work
- Analysis of Current Utilization Pattern
 - Standing orders
 - Redundancy (profiles, reflex testing)
 - Frequency
- Laboratory Champion/s (Clinician/s)
- Utilization Committee
 - Physician Peer Review/Score Card/Peer Comparison
 - Best Practice Ordering Guidelines
 - CMS Core Measures

Test Utilization



- Improving Diagnosis:
 - By leveraging EBM, IT, & Teamwork
 - Right test - Improve lab test utilization (avoid iatrogenic anemia)
 - Right time - No treatment delays
 - Right patient - Positive Patient Identification (avoid errors)
 - Right results - Automatic communication, alerts, interpretation, and/or call of clinical significant lab values

Laboratorians are the lab tests expert!

Quality Chasm Series: Health Care Quality Report



- [Preventing Medication Errors: Quality Chasm Series](#) (2007)
- [Improving Diagnosis in Health Care](#) (2015)
- [Improving the Quality of Health Care for Mental and Substance-Use Conditions: Quality Chasm Series](#) (2006)
- [Quality Through Collaboration: The Future of Rural Health Care](#) (2005)
- [Patient Safety: Achieving a New Standard for Care](#) (2004)
- [Keeping Patients Safe: Transforming the Work Environment of Nurses](#) (2004)
- [Fostering Rapid Advances in Health Care: Learning from System Demonstrations](#) (2002)
- [Priority Areas for National Action: Transforming Health Care Quality](#) (2003)
- [Health Professions Education: A Bridge to Quality](#) (2003)
- [Leadership by Example: Coordinating Government Roles in Improving Health Care Quality](#) (2002)
- [Crossing the Quality Chasm: A New Health System for the 21st Century](#) (2001)
- [To Err Is Human: Building a Safer Health System](#) (2000)

Questions?

The information in this presentation is provided for educational purposes only and is not legal advice. It is intended to highlight laws you are likely to encounter, but is not a comprehensive review. If you have questions or concerns about a particular instance or whether a law applies, you should consider contacting your attorney.



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Product
Business
Patient

Thank you



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